

## Research Items.

**Daggers with Inlaid Handles.**—In *Ancient Egypt*, 1930, No. 4, Sir Flinders Petrie, referring to the recent discovery in Palestine of two examples of the dagger having a metal handle cast in one piece with the blade and bearing a plate of inlay on each side, reviews a number of examples of the type which have come into view, in various countries. These he places in six classes: (1) The butt handle, of the simplest type, with a slight curve at the end and the inlay space shallow and long. It begins about 2000 B.C. near Behistun and is found at Nineveh and Ras Shamra. (2) The pommel type, begins with the butt getting wider as in Egypt; the distinct pommel appears in the south-west of the Caspian; the fully developed pommel is on a dagger of Apepa III. (1600 B.C.); the subjects are embossed on electrum plates. This type belongs to North Syria and was brought to Egypt by the Hyksos. (3) The encased handle, begins with the deep setting of the handles as from Kasbek, Caucasus, about 600 B.C. The examples point to a primitive type of pierced bone handle. The encased inlay passed into a form like that of the deeply winged palstave. (4) To give the best grip to the handle for an upward thrust, a cusp was raised, giving the thumb and finger a more secure hold. A preliminary form appears in Hyksos times. It was a development of the tang made in shovel form to insert in a separate handle. (5) The wide blades with cross-head handles are western. The inlay is riveted on. An example of about 1400 B.C. is from Korinth, others from Knossos, Veii, Cuma, and Terni. (6) The falchion (*khepesh*, the thigh), of eastern origin, an example from Diarbekr, of 1300 B.C., has an inlay handle with the name of Hadadnirari, and another of the time of Rameses II. from Tell Retabeh.

**Samoa Culture.**—A detailed and exhaustive analysis of the material culture of Samoa by Te Rangi Hiroa (P. H. Buck) appears as *Bull.* 75 of the Bernice P. Bishop Museum of Honolulu. The summary of conclusions drawn is that canoes with topsides or planks joined by right-through lashing associated with the rectangular house with wall posts and wall plate erected before the principal rafters were put up, the bow and arrow, slings, and such games as dart-slinging, bowling with discs, and string figures constitute an early culture which spread over the whole Polynesian area. Certain culture-traits such as the marae, stone figures, upright drums, and the nose-flute passed into eastern Polynesia without affecting Samoa. The striking features distinguishing Samoan culture from the general culture of eastern Polynesia are the arched houses and the flanged-plank canoes. Special efforts resulting in improved technique are closely related with class distinctions. Building and tattooing obtained their highest remuneration from the higher classes and these crafts were used to accentuate class distinction. The builders' guilds had more set rules than they had in eastern Polynesia. The Samoan system demands instant payment and immediate provision of food, as against the usual Polynesian system of reciprocal labour. Samoan material culture is uninspired.

**Experimental Studies of Dengue.**—Dengue is an acute, but benign, fever of 2-7 days duration and prevalent in the east. In the Philippines, the disease has recently been the subject of investigation by Majors J. S. Simmons and J. H. St. John, of the Medical Corps, and Captain F. H. K. Reynolds, Veterinary Corps, U.S. Army (*Philippine Jour. Sci.*, vol. 44, 1931, p. 1). The disease is caused by a filterable virus, and is transmitted by mosquitoes of

at least two species in the Philippines, *Aedes aegypti* and *A. albopictus*. It is shown that 5-10 infected mosquitoes convey the disease just as well as 150. The mosquitoes to become infected must bite the patient during the first two days of illness, but they do not transmit until twelve or more days later. It is probable that one attack of the disease confers a lasting immunity. Attempts to prepare prophylactic vaccines were unsuccessful. Attempts to transmit the disease to a number of animals failed, but evidence was obtained that two Philippine monkeys may act as reservoirs of the virus, and may be factors in the spread of dengue. A prolonged study of the blood during the course of the disease was made. An outstanding feature is a remarkable diminution in the white corpuscles at the height of the fever to one-half the normal or even less.

**A Bird Census in California.**—Slowly increasing numbers of bird-counts emphasise the variable size of the populations of areas of different character: there may be an average of less than a pair of birds to the acre in some places, and in others so many as fifty-four pairs—both these record areas happen to be in the United States of America. A new region in California—the Lassen Peak Region—has been intensively studied by Joseph Grinnell, Joseph Dixon, and Jean M. Linsdale, and among the many interesting observations in their 500-page monograph appears a census of the birds (*Univ. California Publ. Zool.*, vol. 35; 1930). The count covered an area of 6½ acres, searched daily at all hours of the day for 16 days in June, during the breeding season. Twenty-four breeding pairs were established there, not quite four to the acre. Neither casual nor regular visitors to the checked area from other areas were included. The authors consider that the average population of the whole Lassen Region is over-represented in the selected area, and from 'time' censuses and memory impressions they would place the general average at not more than one breeding pair to the acre. The results of the systematic study of the birds themselves suggest that where individuals of a particular species are sparsely distributed and the habitat greatly interrupted, the chances for developing and perpetuating local population strains are better than in an area of contrary nature. The mammals and reptiles of the Lassen Region, as well as the birds, give many apparently good cases illustrating this point.

**True's Beaked Whale in the Hebrides.**—An example of this very rare whale was stranded on the Outer Hebrides in January, and has been described by A. C. Stephen (*Scottish Naturalist*, 1931, p. 37). The length of the whale was 17 ft. 6 in., and the head, which is now in the Royal Scottish Museum, possesses the single pair of teeth, set at the extreme end of the lower jaw, which is a leading character of the species. Only twice before has this whale been found in British waters, on both occasions on the west of Ireland, and two further records, from the east coast of the United States of America, complete the known appearances of one of the most elusive of whales.

**Spiders of Porto Rico.**—The three parts of the work of this title recently issued (*Trans. Connect. Acad. Arts Sci.*, 30, 1-158, 159-335; 1929; 31, 1-191; 1930) represent the result of Prof. A. Petrunkevitch's stay as visiting professor to the University of Porto Rico during 1925-26. The spiders of the island are increased from 74 to 174 species in 100 genera; one genus and 72 species are new, and all are very fully described, with the help of 562 detailed diagrams. A

new method of describing the appearance of a spider's leg is introduced as being more accurate than words like 'stout' or 'slender'. This consists in expressing the breadth of the patella as a percentage of the united length of tibia and patella, and is known as the 'tibial index'. Thus, for a pholcid the index is 2, for a theraphosid it is 13. A promised discussion of the Porto Rican fauna as compared with that of the other islands and of the clues as to its origin and evolution is eagerly anticipated.

**Echinoderm Oogenesis.**—L. A. Harvey (*Proc. Roy. Soc.*, vol. 107; 1930) discusses the cytology of oogenesis in *Antedon* and *Asterias*. The chief difference noted is that in the oocyte of the former genus, a yolk nucleus is present, but not in the oocyte of *Asterias*. Yolk appears in both under the influence of the Golgi apparatus, which consists of scale-like dictyosomes visible in the living egg in *Antedon* but not in *Asterias*. The mitochondria are early scattered in the cytoplasm and are present in large numbers. It is suggested that they are concerned in the synthesis of yolk from raw materials in the cytoplasm. Fat arises as minute droplets scattered among the yolk spherules; neither Golgi apparatus nor mitochondria are concerned in their appearance in the cell.

**Observations on Tetrarhynchids.**—Prof. Th. Pintner (*Sitz. Akad. Wiss. Wien, Mat.-naturwiss. Klasse*, 139 Bd., 7 Hft., 1930) gives an account of the anatomy and systematics of some little-known tetrarhynchid cestodes, with keys to the genera and species, and adds observations on the movements of the young encysted forms. In the fresh liver of the teleostean fishes *Lepidopus* and *Brama*, the young worm lies motionless in the cyst; but as soon as the liver begins to decompose, movements in the head region begin. Apparently only chemical or temperature stimuli will provoke these movements, for rough handling with a preparation needle produces no contraction. The author suggests that a stimulus would be provided in the alimentary tract of the final host (an elasmobranch) when the liver is in process of digestion and would cause the larva to strive to free itself from the cyst. The paper is illustrated by 73 figures.

**Researches on Diatoms.**—Miss S. M. Marshall and A. P. Orr continue their valuable researches on diatoms in their latest paper "A Study of the Spring Diatom Increase in Loch Striven" (*Journal of the Marine Biological Association of the United Kingdom*, 16, 3; 1930). Experiments with diatom cultures and sea-water samples were carried on at the same time as the general studies. During the three years 1926, 1927, and 1928, this increase was almost wholly due to *Skeletonema costatum*, which is able to grow within wide temperature limits. There were very few other diatoms, and animals were scarce. The pH value and oxygen content rose and the phosphate fell with the increase in numbers of diatoms. It was found that temperature is not the direct cause of the beginning of the increase, but the density of the water which is influenced by the temperature is important, because it determines the amount of vertical mixing. The vertical currents, besides bringing up the nutrient salts, carry the diatoms from the surface layers, where there is much light, to the deeper waters, where in winter and early spring there is not enough light for photosynthesis to balance respiration. With the lengthening of the days and better weather conditions the depth at which photosynthesis may take place increases. Regarding light intensity, it is shown that in Loch Striven the date of the spring diatom increase is apparently decided chiefly by the total light, which depends both on length of day and intensity.

**Crossing-over in Tetraploid *Primula sinensis*.**—An interesting paper by Miss D. de Winton and Prof. J. B. S. Haldane (*Jour. Genet.*, vol. 24, No. 1) makes a comparison of the linkage relations in the diploid and the autotetraploid *Primula sinensis*. Three factors are considered—*S*, which converts pin to thrum; *B*, which converts red flower to magenta; and *G*, which produces green stigma and ovary, inhibiting red. Only *S* is fully dominant when present in one dose in the tetraploid. Six of the seven possible types of linkage between these three factors in the tetraploid have been studied. The intensity of linkage is about the same as in the diploid, but, unlike the diploid, there is no significant difference in the linkage on the male and female side. The results agree well with theory, notwithstanding that Darlington (in the same number) has found numerous meiotic irregularities in the  $4n$  form. No evidence was obtained of crossing-over between more than two chromosomes of a set at one time, nor of two chromosomes going to the same pole after crossing-over. The results to be expected in the offspring of the different types of tetraploid zygote when selfed, with or without crossing-over, are given in a useful table.

**'Collapse' in Australian Timber.**—C. Sibley Elliot, assistant seasoning officer of the Australian Division of Forest Products, has an interesting paper in the *Journal of the Council for Scientific and Industrial Research*, vol. 3, No. 4, upon the occurrence of 'collapse' during drying of Australian timbers. This is entirely different from the normal shrinkage and swelling of timber with changing water content. Shrinkage is associated with an approach of the fibres towards one another as the timber dries, and cannot be prevented. 'Collapse', on the contrary, involves the actual breaking down of many of the microscopic tubular elements in the wood, and it is frequently accompanied by considerable distortion in consequence. 'Collapse' occurs in several of the Australian eucalypts to a considerable extent; in Australian-grown timber it occurs mainly in the young outer wood or in wood from the upper part of the tree. It may occur when the water content of the wood is still relatively high (more than 80 per cent), and has been attributed by H. D. Tiemann, of the Forest Products Laboratory, Madison, U.S.A., to the stresses set up within the wood by the continuous films of water in drying wood when air is unable to enter. Whilst shrinkage of wood is inevitable as moisture content changes, the collapse can be corrected and permanently removed by the prolonged action of steam after the timber has been previously dried to a moisture content of 10-12 per cent. This process, under the name of 'reconditioning timber', has been successfully adopted under commercial conditions in many large-scale plants in Australia.

**Palaeozoic Diatoms.**—An illustrated account of diatoms found in deposits of Carboniferous and Permian age is given by D. Vito Zanon (*Mem. Accad. Scienze, I Nuovi Lincei*, ser. 2, vol. 14, 1930, p. 89). Some sixty species are recognised, most of which are identified with living forms.

**The Atlas Mountains.**—In the *Scientific Monthly* for February, Prof. H. C. Lawson discusses the origin of the Atlas mountains of Morocco. They have the characteristics of a youthful range, with narrow valleys, sharp ridges, and peaks. The torrential streams flow in trenches far above the base-level of erosion. Features such as these cannot have survived from the time of the Alpine uplift, and Prof. Lawson argues that the Atlas have undergone a rejuvenation. His

reading of the evidence, which he details in full, is that at the end of the Eocene the Alpine uplift gave rise to what he calls the Alpine Atlas, on the site of the geosyncline which occupied part of the area of the submerged peneplain that succeeded the Hercynian mountains. By the end of the Tertiary period the Alpine Atlas had been reduced to a past-mature hill range and the surrounding country to a peneplain. Then came the rejuvenation which led to the present Atlas. This was due to two movements: a broad arching which uplifted the peneplain to about 1200 metres, and a sharp orogenic upthrust between marginal faults. The degradation of the upthrust mass and consequent loss of load induced further rise by isostatic adjustment. The depressions flanking the range are explained as due to sinking of material in compensation for loss of load on the range.

**The Atlantic Earthquake of 1929.**—Two interesting papers on the earthquake of Nov. 18, 1929, by D. S. McIntosh and Dr. J. H. L. Johnstone appear in the *Transactions of the Nova Scotian Institute of Science* (vol. 17, pp. 213-222, 223-237; 1930. See also the letter by Prof. J. W. Gregory in *NATURE*, vol. 124, pp. 945-946; 1929). The cable breaks all occurred from lat. 39° 29' to 45° 6' N. and long. 52° 10' to 57° 56' W., that is, within an area of about 60,000 sq. miles, in a line with the old submerged portion of the St. Lawrence river. The depths at which the cables were broken range from 44 to 2934 fathoms, and the officers in charge of the repair work found no difference from the charted depths greater than those that might be due to errors in sounding. In many cases, the broken cable ends were found buried in mud or gravel. The ends appear as though the cable had been cut by a dull pair of heavy scissors, except at one spot (in lat. 43° 27' N., long. 56° 13' W.) where "the cable was found broken up in short lengths and the core twisted round the sheath. The wires of the sheath were bent back on themselves two or three times, wound around the core, and the latter twisted about the heavy galvanised steel sheath." From seismographic evidence, the epicentre is estimated by Messrs. Hodgson and Doxsee to lie in lat. 44° 5' N., long. 55° 15' W., which is nearly that obtained from the times of arrival of the sea-waves at Halifax and the Newfoundland coast.

**Variations of the Solar Constant and Terrestrial Weather.**—Dr. C. G. Abbot, in a paper entitled "Weather dominated by Solar Changes" (*Smithsonian Miscellaneous Collections*, vol. 85, No. 1) continues his studies of variations of the solar constant and their influence on terrestrial weather. He finds that periods of increasing or decreasing solar radiation are followed by changes of pressure and temperature at Washington. These changes are irregular and differ considerably in different months; but those following increasing radiation are, on the whole, opposite to those following decreasing radiation, suggesting that though difficult to understand, they are probably real. An additional test is obtained by investigating the solar constant for periodicities; by a graphical method lengths of 8, 11, 25, 45, and 68 months are found, the combination of which reproduces the original curve with reasonable accuracy. The monthly mean temperatures at Washington for the period 1918-30, corrected for annual variation, are then analysed for the same periodicities and the results, with the addition of a terrestrial period of 18 months, are combined to form a curve not unlike the original. It should be remarked, however, that Dr. Abbot does not point out that the phases of the periodicities of temperature at Washington have no definite relation to the phases of the corresponding

solar cycles. Moreover, if the 18-month periodicity is omitted, the calculated temperatures have a correlation of only 0.36 with the observed figures, so that they cannot be said to be "dominated" by solar changes, and the relationship will have little value for forecasting.

**Lubrication and Viscous Flow.**—Several investigators of lubricating oils have found that, when such oils are allowed to flow for some time through capillary tubes of internal diameter of 0.3 mm., the tubes become clogged in a few hours. This clogging has generally been explained as due to the orientation and adsorption of the polar constituents of the oil by the walls of the tube, and in the first Report of the Lubrication Research Committee, Sir William Hardy expressed the opinion that none of the liquid between two solid surfaces is free unless it is at least  $5 \times 10^{-4}$  cm. from each surface. The January issue of the *Journal of Research* of the U.S. Bureau of Standards contains a paper by Dr. R. Bulkley giving an account of his measurements of the flow of oils through capillary tubes, which have been carried out with the support of the Research Committee on Lubrication of the American Society of Mechanical Engineers to test whether this adsorption by the walls takes place. He finds that when the oils are filtered through porcelain before entering the capillary tube, they show no signs of clogging even in tubes of  $11 \times 10^{-4}$  cm. diameter. He considers that the evidence points more in the direction of slipping of the oil at the wall, or, if there is any increase of the viscosity of the oil near the wall, that increase does not extend more than  $0.02$  or  $0.03 \times 10^{-4}$  cm. from the wall.

**Free Radicals.**—Conant, Small, and Taylor in 1925 showed that halochromic (coloured) salts of triphenylcarbinol and related substances are reduced by powerful reducing agents in appropriate solutions with the formation of the free radical (for example, triphenylmethyl). A similar result would be expected in regard to the cations of the triphenylmethane dyes, except that the resulting free radical would probably be even less stable in acid solution than triphenylmethyl. In the February *Journal of the American Chemical Society*, Conant and Bigelow show that these expectations are confirmed by experiment. The following general reactions are assumed, in which  $R^+$  is the dye cation and  $M^{++}$  the titanous, vanadous, or chromous ion used in reduction:

- (1)  $R^+ + M^{++} \rightleftharpoons R$  (free radical) +  $M^{+++}$ ,
- (2)  $2R \rightleftharpoons R - R$  ('ethane'),
- (3)  $2R + H^+ \rightarrow RH$  ('methane') +  $R^+$ ,
- (4)  $2R \rightarrow R_2$  (Chichibabin compound).

Reactions (1) and (2) are reversible and rapid; (3) and (4) are irreversible. The products of reactions (2), (3), and (4) were isolated in the case of malachite green and *p*-dimethylamino-triphenylcarbinol. In order to isolate the associated free radical ('ethane'), advantage was taken of its relative insolubility in aqueous solutions of pH 3. The solutions absorb oxygen very rapidly, as much as 89 per cent of the amount required for peroxide formation being taken up by the crude dried material. The nomenclature used in (4) is based on the analogous formation of *p*-benzhydryl-tetraphenylmethane from triphenylmethyl, first observed by Chichibabin, although the structures of the dimers obtained, isomeric with the 'ethanes', have not been established. Their empirical formulæ show them to be dimolecular reduction products of the cations. The action of vanadous or chromous chloride on the keto-chloride of Michler's ketone is similar to the reduction of salts of the diphenyl carbinols. The electrochemistry of the reactions is to be studied.